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organs, there is less departure from the ordinary methods. There is a discussion, much after the usual fashion, of the "morphology" of the flower-cluster, and the flower, and in this the student will receive few if any new ideas. In the discussion of reproduction proper there is again much more that is modern and instructive. Thus we have:

(I.)—Non-sexual reproduction.
(II.)—Sexual reproduction.
    1.—Sexual reproduction of the Cryptogams.
    2.—Sexual reproduction of the Phanerogams.
    3.—Relation of sexual to non-sexual reproduction.

An interesting section is devoted to the phylogenetic development of the flower. The "flower" is very properly regarded as an evolution from modifications of the plant-body found in the Pteridophytes. The spore-bearing cone of Selaginella is "the prototype of an hermaphrodite naked flower," between which there is often a marked external resemblance.—CHARLES E. BESSEY.

ZOOLOGY.

A New Phoronis.—Dr. E. B. Andrews has found a new species of the remarkable genus Phoronis at Beaufort, N. C. It lives in isolated chitin-like tubes placed upright in the sand. The species has the greatest affinity with *Ph. kowalevskii* in the arrangement of its sixty tentacles, but it is remarkable for the presence of spoon-shaped glandular organs at either end of the lophophore. The function of these organs is unknown, but it is suggested that they may have some connection with the tube-building habit. The alimentary canal consists of two stomachs and an intestine. In the first stomach there is a longitudinal ridge of ciliated gland-cells, recalling that of Sipunculus. There is also a peculiar intracellular digestion in the first stomach. Apparently the sexes are separate. The left nerve-rod only has an extensive development. Dr. Andrews thinks that this species, which he has named *Ph. architecta*,[1] approaches nearer to the Sipunculid than to the Polyzoan type.

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[1] *Ann. and Mag. Nat. Hist.*, June, 1890.

The Arthropod Eye.—Dr. Patten,[2] from a study of the eyes in several hexapods, concludes that "the convex eye of arthropods is a group of hair-bearing sense buds." New facts are presented regarding the eyes of Belostoma, Tabanus, and Vespa, and the following additional conclusions are drawn: The so-called pseudocone is the homologue of cuticular sense hairs; between the ommatidia occur hair-cells, which are surrounded by pigment, "so that they bore a very striking resemblance to ommatidia, and probably functioned as such." As a corollary the pseudocone type is the most primitive. Watase's view is regarded in this light as erroneous, the development of Vespa showing that there is no bending of the retinula cells. Patten thinks that a "telescoping" rather than an invagination must be invoked to explain the features of the arthropod eye. Corrections are made of former statements as to the relationships of the corneagen cells to the spindle (rhabdom), and the formation of the corneagen in Vespa.

Molluscan Notes.—Canon A. M. Norman, the English student of the invertebrata, has begun in the *Annals and Magazine of Natural History* a revision of the British mollusca.

It may interest conchologists to learn that the somewhat rare mollusc *Zirfœa crispata* occurs abundantly at Salem, Mass., at a spot where it is easily accessible at low tide. The locality is in a bed of indurated clay, about midway between the "neck" and the beacon on the neck bar. At low tide they are covered by but two or three inches of water.

The Origin of Vertebrates.—Two recent papers attempt to find the ancestors of the vertebrates in the arthropods. The first, by Dr. William Patten,[3] recognizes this ancestor in the arachnids. The nervous system is compared throughout with that of vertebrates, and some startling homologies are brought out, embracing not only general relationships but exact correspondences in minute details of sense organs, segments, nerves, etc. The vertebrate mouth arises as a modification of the dorsal organ, the notochord from the the mittelstrang of the arthropod nervous system, the cranium from the entosternite, the gill slits from nephridia; the pectoral fins are homologous with the scorpion pectines! Aside from these speculations the paper contains a number of observations on the embryology of scorpions and of Limulus.

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[2] *Anat. Anzeiger*, V., p. 353, 1890.

[3] *Quar. Jour. Micros. Sci.*, XXXI., p. 317, 1890.

The second paper, by Dr. W. H. Gaskell,[4] is fairly appalling. In two former papers[5] we had been favored with a foretaste of this wonderful production, but here it appears in detail so far as the first chapter is concerned. Space will permit but a mere outline. Like Dr. Patten, he seeks the ancestor of the vertebrates in the arthropods, but there all unity ceases. The crustacean nervous system has grown around the alimentary canal, the latter producing the ventricles of the brain and the central canal of the spinal cord. The crustacean gill-bearing legs have been infolded, and give rise to the vertebrate gill-arches, while from the cavity thus formed the vertebrate alimentary canal has grown backward. The pituitary body is the green gland.

Amphioxus in Tampa Bay.—Since some recent attempts to obtain Amphioxus in Chesapeake Bay have been unsuccessful, and since there is considerable difficulty in securing it from other known stations, as Beaufort, N. C., the Bermudas, the West Indies, etc., it may be of interest to know that specimens were abundant and easily secured at Port Tampa, Fla., in March last. The "Port" is eight miles from the city of Tampa, and consists of a railroad trestle-work running out nearly a mile over the shallow water to the wharf where the Havana steamers land. Working from a boat, with only a dip-net, in water from four to six feet deep, some specimens could be obtained with every dip. They were upon the surface of the clean sand. The ground worked over was southward from the wharf, and extended about a mile along the margin of the ship-channel, which is marked by buoys. The location is so far from shore, and so far from disturbing agencies, that it might be expected to yield a constant supply. A light dredge, with fine-meshed bag, would be the most efficient collecting instrument. The specimens were from one to two inches in length.—Albert A. Wright.

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[4] *Quar. Jour. Micros. Sci.*, XXXI., p. 379, 1890.

[5] *Jour. Physiol.*, X.; *Brain*, XII., 1890.